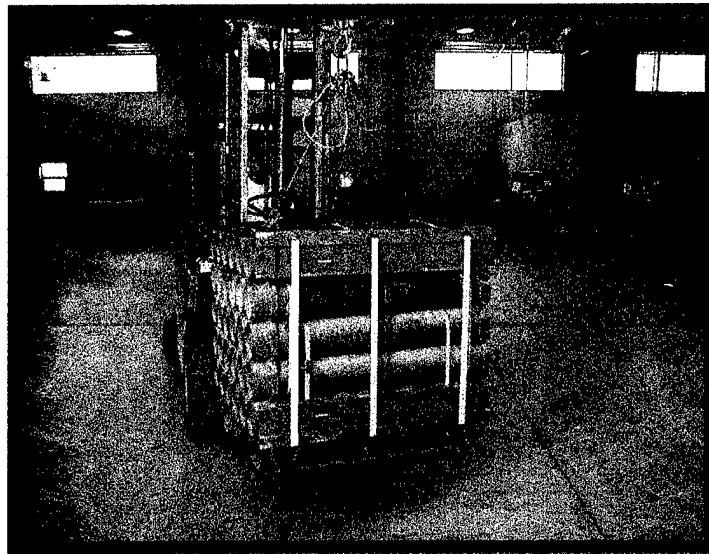


**FINAL REPORT
JUNE 2001**

REPORT NO. 01-14



**PALLET, STANDARD SIZE 44 x 40, SHEET METAL,
MANUFACTURED BY
ARMOR METAL FABRICATION, INC.,
MIL-STD-1660, FIRST ARTICLE TEST (FAT)**

Prepared For:

Armor Metal Fabrication, Inc.,
Williamson Metal Works
1200 Clifty Drive
Madison, IN 47250

Distribution Unlimited



**VALIDATION ENGINEERING DIVISION
MCALESTER, OKLAHOMA 74501-9053**

20010807 060

AVAILABILITY NOTICE

A copy of this report will be furnished each attendee on automatic distribution. Additional copies or authority for reprinting may be obtained by written request from:

Director
U.S. Army Defense Ammunition Center
ATTN: SMAAC-DEV
1 C Tree Road, Bldg. 35
McAlester, OK 74501-9053

Reports may also be downloaded or viewed in PDF format from our web site at:

<http://www.dac.army.mil/DEV/TestReports>

DISTRIBUTION INSTRUCTIONS

Destroy this report when no longer needed. Do not return.

Citation of trade names in this report does not constitute an official endorsement.

The information contained herein will not be used for advertising purposes.

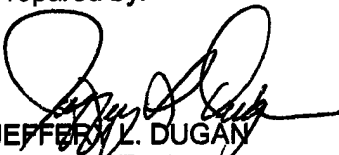
REPORT NO. 01-14
PALLET, STANDARD SIZE 44 X 40, SHEET METAL
MANUFACTURED BY:
ARMOR METAL FABRICATION, INC.,
MIL-STD-1660, FIRST ARTICLE TEST (FAT)

JUNE 2001

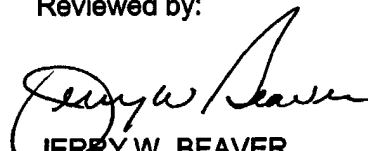
ABSTRACT

The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SMAAC-DEV), was tasked by Armor Metal Fabrication, Inc. to conduct a First Article Test (FAT) per MIL-STD-1660, "Design Criteria for Ammunition Unit Loads" on the Pallet, Standard Size 44 x 40, Sheet Metal. Three pallets were evaluated using the MIL-STD-1660 test requirements. Significant flaws were found in all three pallets. Three additional pallets were received and tested. The first two pallets passed all test requirements; therefore, the third pallet was not tested. As a result of the performance of Pallet 1 and Pallet 2 of the second group during testing, the Pallet, Standard Size 44 x 40, Sheet Metal, manufactured by Armor Metal Fabrication, Inc., in Madison IN, is recommended for USA-wide use.

Prepared by:


JEFFERY L. DUGAN
Validation Engineer

Reviewed by:


JERRY W. BEAVER
Chief, Validation Engineering Division

U.S. ARMY DEFENSE AMMUNITION CENTER

VALIDATION ENGINEERING DIVISION
MCALESTER, OK 74501-9053

REPORT NO. 01-14

**PALLET, STANDARD SIZE 44 X 40, SHEET METAL,
MANUFACTURED BY ARMOR METAL FABRICATION, INC.,
MIL-STD-1660 TESTS,
FIRST ARTICLE TESTS (FAT)**

TABLE OF CONTENTS

PART	PAGE NO.
1. INTRODUCTION	1-1
A. BACKGROUND	1-1
B. AUTHORITY	1-1
C. OBJECTIVE	1-1
D. CONCLUSION	1-1
2. ATTENDEES	2-1
3. TEST PROCEDURES	3-1
4. TEST EQUIPMENT	4-1
5. TEST RESULTS	5-1
6. DRAWINGS.....	6-1

PART 1 – INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SMAAC-DEV), was tasked by the Armor Metal Fabrication, Inc. from Madison, IN, to conduct First Article Test (FAT) per MIL-STD-1660," Design Criteria for Ammunition Unit Loads," on the Pallet, Standard Size 44 x 40, Sheet Metal. The unitization procedures were provided by DAC, Transportation Engineering Division (SMAAC-DET).

B. AUTHORITY. This test was conducted IAW mission responsibilities delegated by the U.S. Army Operations Support Command (OSC), Rock Island, IL. Reference is made to the following:

1. Change 6, AR 740-1, 18 August 1976, Storage and Supply Activity Operation.
2. IOC-R, 10-23, Mission and Major Functions of USADAC, 7 January 1998.

C. OBJECTIVE. The objective of the tests was to accomplish First Article Tests (FAT) to ensure the metal pallet met MIL-STD-1660 requirements prior to the acceptance of the pallet for use by the U.S. Army.

D. CONCLUSION. Two different sets of three pallets were evaluated using MIL-STD-1660 test requirements on separate dates. The first set of three pallets failed the tests due to the pallet posts protruding through the pallet deck in several locations. Before initial testing of the pallets, it was noted that the pallet decks were bowed. Only two of the three pallet skids contacted the ground at one time due to the bowed pallet decks. This bowing introduced a rocking motion to the unit load when the vibration test was performed. It was determined that the rocking motion produced excessive stress on the middle skid during vibration testing, causing the pallet posts to protrude through the pallet deck. The problem was noted and the manufacturer corrected the flatness issue and

delivered the second set of three pallets to be tested. No significant flaws were found in the second set of pallets during testing. As a result of the performance of the second set of pallets during the last test, the Pallet, Standard Size 44 x 40, Sheet Metal manufactured by Armor Metal Fabrication, Inc. in Madison, IN, is recommended for use U.S. Army-wide.

PART 2 - ATTENDEES

DATES PERFORMED:

First Set:

Pallet 1: 20-22 February 2001

Pallet 2: 26-28 February 2001

Pallet 3: 3 March 2001

Second Set:

Pallet 1: 15 May 2001

Pallet 2: 16 May 2001

Pallet 3: Not tested.

ATTENDEE

Jeffery L. Dugan
General Engineer
DSN 956-8090
(918) 420-8090

Daryl Sieczkowski
Electronics Technician
DSN 956-8988
(918) 420-8988

MAILING ADDRESS

Director
U.S. Army Defense Ammunition Center
ATTN: SMAAC-DEV
1 C Tree Road, Bldg. 35
McAlester, OK 74501-9053

Director
U.S. Army Defense Ammunition Center
ATTN: SMAAC-DEV
1 C Tree Road, Bldg. 35
McAlester, OK 74501-9053

PART 3 - TEST PROCEDURES

The test procedures outlined in this section were extracted from the MIL-STD-1660, "Design Criteria for Ammunition Unit Loads," 8 April 1977. This standard identifies steps that a unitized load must undergo if it is to be considered acceptable. The seven tests that were conducted on the test pallets are summarized below.

A. STACKING TEST. The unit load was tested to simulate a stack of identical unit loads stacked 16 feet high, for a period of one hour. This stacking load was simulated by subjecting the unit load to a compression weight equal to an equivalent 16-foot stacking height. The compression load was calculated in the following manner. The unit load weight was divided by the unit load height in inches and multiplied by 192 less the weight of one pallet load. The resulting number was the equivalent compressive force of a 16-foot-high load. Figure 1 below shows an example of a unit load in the compression tester.

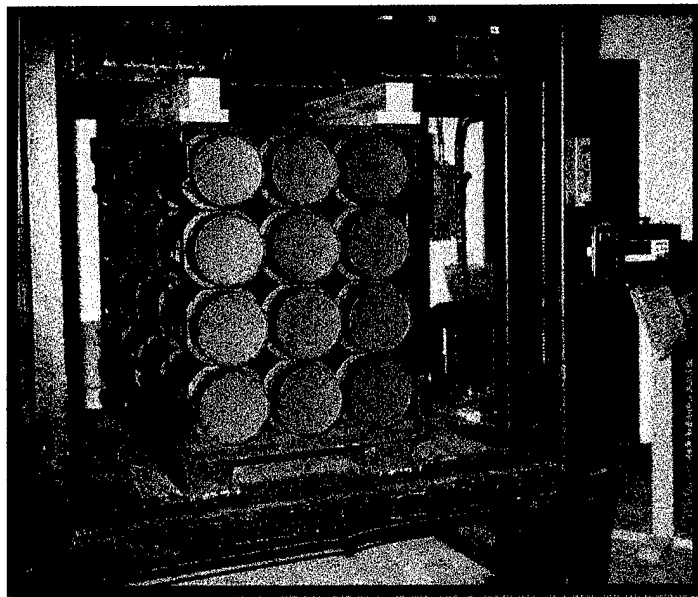
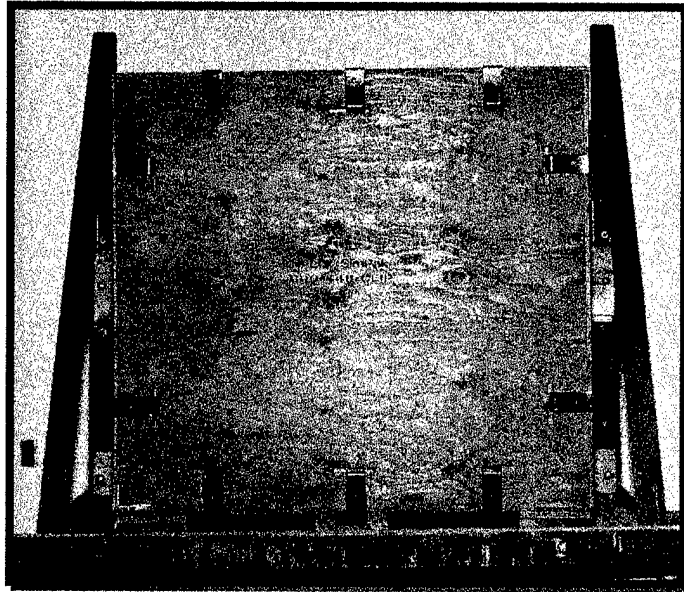


Figure 1. Example of Compression Tester.
(2.75-inch Hydra 70, PA151 Rocket Pallet in the compression tester.)

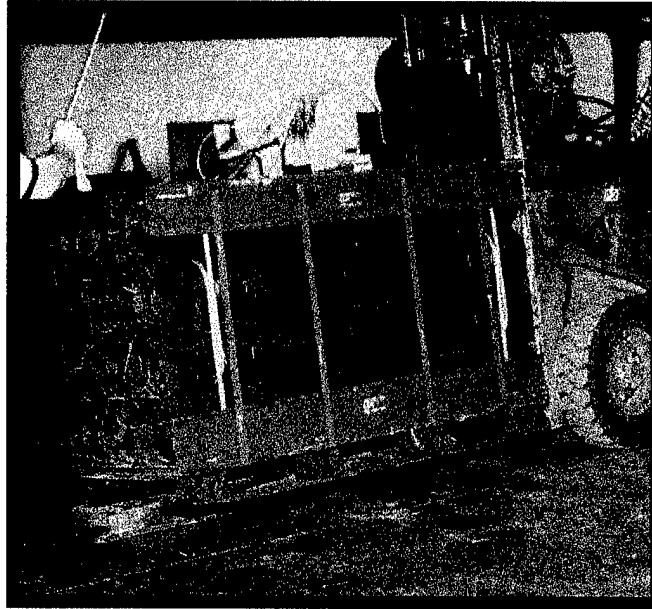
B. REPETITIVE SHOCK TEST. The repetitive shock test was conducted IAW Method 5019, Federal Standard 101. The test procedure is as follows: The test specimen was placed on (not fastened to) the platform. With the specimen in one position, the platform was vibrated at 1/2-inch amplitude (1-inch double amplitude) starting at a frequency of approximately 3 cycles-per-second. The frequency was steadily increased until the package left the platform. The resonant frequency was achieved when a 1/16-inch-thick feeler gage momentarily slid freely between every point on the specimen in contact with the platform at some instance during the cycle. Midway into the testing period, the specimen was rotated 90 degrees, and the test continued for the duration. Unless failure occurred, the total time of vibration was three hours. Figure 2 shows an example of the repetitive shock test.



**Figure 2. Example of the Repetitive Shock Test.
("Clip-Lok" pallet on the vibration table.)**

C. EDGEWISE ROTATIONAL DROP TEST. This test was conducted using the procedures of Method 5008, Federal Standard 101. The procedure for the edgewise rotational drop test is as follows: The specimen was placed on its skids with one end of the pallet supported on a beam 6 inches high. The height of the beam was increased if necessary to ensure that there was no support for the skids between the ends of the pallet when dropping took place, but was not high enough to cause the pallet to slide on the supports when the dropped end was raised for the drops. The unsupported end of the pallet was then raised and allowed to fall freely to the concrete, pavement, or similar underlying surface from a prescribed height. Unless otherwise specified, the height of drop for level A protection conforms to the following tabulation:

GROSS WEIGHT (WITHIN RANGE LIMITS) (Pounds)	DIMENSIONS OF ANY EDGE, HEIGHT OR WIDTH (WITHIN RANGE LIMITS) (Inches)	HEIGHT OF DROPS ON EDGES	
		Level A (Inches)	Level B (Inches)
150-250	60-66	36	27
250-400	66-72	32	24
400-600	72-80	28	21
600-1,000	80-95	24	18
1,000-1,500	95-114	20	16
1,500-2,000	114-144	17	14
2,000-3,000	Above 145- No limited	15	12
Above – 3,000		12	9



**Figure 3. Example of Edgewise Rotational Drop Test
(2.75-inch Hydra 70, PA151 Rocket Pallet)**

D. INCLINE-IMPACT TEST. This test was conducted by using the procedure of Method 5023, Incline-Impact Test of Federal Standard 101. The procedure for the incline-impact test is as follows: The specimen was placed on the carriage with the surface or edge to be impacted projecting at least 2 inches beyond the front end of the carriage. The carriage was brought to a predetermined position on the incline and released. If it were desired to concentrate the impact on any particular position on the container, a 4- x 4-inch timber would be attached to the bumper in the desired position before the test. The carriage struck no part of the timber. The position of the container on the carriage and the sequence in which surfaces and edges were subjected to impacts was at the option of the testing activity and depended upon the objective of the test. This test was to determine satisfactory requirements for a container or pack, and, unless otherwise specified, the specimen was subjected to one impact on each surface that has a dimension of less than 9.5 feet. Unless otherwise specified, the velocity at the

time of the impact was 7 feet-per-second. Figure 4 shows an example of this test.

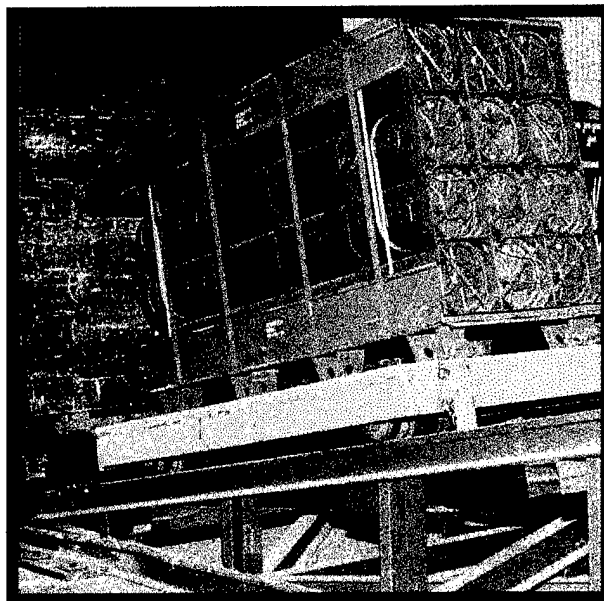


Figure 4. Example of the Incline-Impact Test.
(2.75-Inch, Hydra 70, PA151 Rocket Pallet on incline-impact tester.)

E. SLING COMPATIBILITY TEST. Unit loads utilizing special design or non-standard pallets shall be lifted, swung, lowered and otherwise handled as necessary, using slings of the types normally used for handling the unit loads under consideration. Slings shall be easily attached and removed. Danger of slippage or disengagement when load is suspended shall be cause for rejection of the unit load.

F. FORKLIFTING TESTS. The load shall be lifted clear of the ground by a forklift from the end of the load and transported on the forks in the level or back-tilt position across a hard pavement for a distance of not less than 100 feet. The forklift shall pass over the forklift hazard course as outlined in MIL-STD-1660. The forklift shall pass over the forklift hazard course 3 times in approximately 23 seconds, and then be brought to a stop. The load shall

be observed for deflection and damage. The load shall be rotated 90 degrees and the load lifted from the side and the above steps repeated.

G. DISASSEMBLY TEST. Following all rough handling tests the unit load may be squared up within 2 inches of its original shape on a flat level surface. The strapping shall then be cut and removed from the palletized load. Assembly of the load shall be such that it retains its unity upon removal of the strapping.

PART 4 - TEST EQUIPMENT

A. COMPRESSION TESTER.

- | | |
|-----------------------|----------------------|
| 1. Manufacturer: | Ormond Manufacturing |
| 2. Platform: | 60- by 60-inches |
| 3. Compression Limit: | 50,000 pounds |
| 4. Tension Limit: | 50,000 pounds |

B. TRANSPORTATION SIMULATOR.

- | | |
|------------------|---------------------|
| 1. Manufacturer: | Gaynes Laboratory |
| 2. Capacity: | 6,000-pound payload |
| 3. Displacement: | 1/2-inch amplitude |
| 4. Speed: | 50 to 400 RPM |
| 5. Platform: | 5- by 8-foot |

C. INCLINED PLANE.

- | | |
|------------------|--------------------|
| 1. Manufacturer: | Conbur Incline |
| 2. Type: | Impact Tester |
| 3. Grade: | 10 percent incline |
| 4. Length: | 12-foot |

PART 5 - TEST RESULTS

A. PALLET DATA. Both sets of the three pallets were inertly loaded to the specified design weight using sand to bring each container individually to the required weight. Special care was taken to ensure that each container had the proper amount of weight in order to achieve a realistic pallet center of gravity (CG). Once properly prepared, the pallets were tested using MIL-STD-1660, "Design Criteria for Ammunition Unit Loads," requirements.

SET #1:

PALLET 1:

Date: 20-22 February 2001
Weight: 2,300 pounds
Length: 44-1/2 inches
Width: 42-3/4 inches
Height: 40-3/8 inches

PALLET 2:

Date: 26-28 February 2001
Weight: 2,300 pounds
Length: 44-1/2 inches
Width: 42-3/4 inches
Height: 40-3/8 inches

PALLET 3:

Date: 3 March 2001
Weight: 2,300 pounds
Length: 44-1/2 inches
Width: 42-3/4 inches
Height: 40-3/8 inches

SET #2:

PALLET 1:

Date: 15 May 2001
Weight: 2,300 pounds
Length: 44-1/2 inches
Width: 42-3/4 inches
Height: 40-3/8 inches

PALLET 2:

Date: 16 May 2001
Weight: 2,300 pounds
Length: 44-1/2 inches
Width: 42-3/4 inches
Height: 40-3/8 inches

PALLET 3:

Date: Not Tested
Weight: 2,300 pounds
Length: 44-1/2 inches
Width: 42-3/4 inches
Height: 40-3/8 inches

B. SET 1, PALLET 1 - TEST RESULTS:

It should be noted that before the testing began Pallet 1 had a "rocking" side-to-side motion. The "rocking" measured about 1/2". Since Pallet 2 was not loaded at the time, it was inspected without any load on it. Pallet 2 also had a "rocking" motion of 1/2" due to the pallet not being flat. The "bow" in the pallets was determined to be a result of the practices used in the pallet fabrication. It was decided that the pallets would be tested.

1. **Compression Test.** Test Pallet 1 was compressed with a load force of 9,200 pounds for 60 minutes on 20 February 2001. No damage was noted as a result of this test.

2. **Repetitive Shock Test.** Test Pallet 1 was vibrated 90 minutes at 165 RPM in the longitudinal orientation and 90 minutes at 182 RPM in the lateral orientation. There were strut skid welds broken in the middle skid in three places. This damage was deemed minor and the tests could continue. No additional damage was noted as a result of this test.

3. **Edgewise Rotational Drop Test.** Test Pallet 1 was edgewise rotationally dropped from a height of 15 inches on the longitudinal and 15 inches on the lateral drops. The strut deck welds and strut skid welds broke in several places. The damage was deemed to be major, but since the extent of the damage could not be totally inspected until the disassembly of the pallet it was decided to complete the test procedures.

4. **Incline-Impact Test.** The test pallet was incline-impacted on all four sides with the pallet impacting the stationary wall from a distance of 8 feet. Again, no additional problems were encountered.

5. **Sling Compatibility Test.** The test pallet was lifted off of the ground using the top lift adapter by four points, three points, two diagonal points, and two adjacent points. No shifting of the containers or permanent deformation of the top lift adapter was noted.

6. **Forklifting Test.** The test pallet was lifted from the end of the pallet on the forks of the forklift truck and carried over the hazard course three times with no damage or instability noted. The pallet lifted from the side of the pallet and the above steps accomplished with no problems encountered.

7. **Disassembly Test.** During the disassembly of the pallet major damage was found with the middle skid struts protruding through the pallet deck. The damage was considered major and the pallet could not have continued to be used in a safe manner; therefore, the pallet failed. The failure was discussed with the manufacturer, and the "rocking" side-to-side motion was pointed out.

8. **Conclusion.** The pallet did not meet MIL-STD-1660, "Design Criteria for Ammunition Unit Loads". The reason for the failure was determined to be caused by stress from excessive loading on the middle skid due to the bowed pallet. No inspection data reports were available to determine if Quality Control Inspections showed if the pallet met design requirements.

C. SET 1, PALLET 2 - TEST RESULTS:

1. **Compression Test.** Test Pallet 2 was compressed with a load force of 9,200 pounds for 60 minutes on 26 February 2001. It was noted before the test that the pallet had the same "rocking" side-to-side motion as Test Pallet 1. No damage was noted as a result of this test.

2. **Repetitive Shock Test.** Test Pallet 2 was vibrated 90 minutes at 169 RPM in the longitudinal orientation and at 90 minutes at 182 RPM in the lateral orientation. All strut skid welds and strut deck weld sustained weld breaks. The damage was considered major, however the pallet had not failed at this point. The tests procedures were continued.

3. **Edgewise Rotational Drop Test.** Test Pallet 2 was edgewise rotationally dropped from a height of 15 inches on the longitudinal and 15 inches on the lateral drops. The pins broke and the deck slid 1-1/2" to the drop side. All skid welds and deck welds broke and continued to get worse with each drop. The damage was deemed to be major, but since the extent of the damage could

not be totally inspected until the disassembly of the pallet it was decided to complete the test procedures.

4. Incline-Impact Test. The test pallet was incline-impacted on all four sides with the pallet impacting the stationary wall from a distance of 8 feet. Again, no additional problems were encountered.

5. Sling Compatibility Test. The test pallet was lifted off of the ground using the top lift adapter by four points, three points, two diagonal points, and two adjacent points. No shifting of the containers or permanent deformation of the top lift adapter was noted.

6. Disassembly Test. During the disassembly of the pallet major damage was found with the middle skid struts protruding through the pallet deck. The damage was considered major and the pallet could not have continued to be used in a safe manner, therefore the pallet failed. This is the second failure of the pallet out of the three to be tested. Since two out of the three pallets must pass the test in order for the pallet to pass the MIL-STD-1660 criteria, this set of pallets failed.

7. Conclusion. The pallet did not meet MIL-STD-1660, "Design Criteria for Ammunition Unit Loads". The reason for the failure was determined to be caused by stress from excessive loading on the middle skid due to the bowed pallet just as was the case for Pallet 1. It was discussed and decided to test Pallet 3 just to see if it had the same problems as the first two pallets.

D. SET 1, PALLET 3 - TEST RESULTS:

Pretest inspections found that the pallet had a "rocking" side-to-side motion due to the pallet being bowed, just as Test Pallets 1 and 2. It was decided that the banding would not be tightened as tight as Test Pallets 1 and 2 to try and lessen

the amount of "rocking" side-to-side. The loaded pallet had a less severe "rocking" motion, but "rocking" was not eliminated by using banding that were not as tight as the banding used on Test Pallets 1 and 2.

1. **Compression Test.** Test Pallet 3 was compressed with a load force of 9,200 pounds for 90 minutes on 3 March 2001. No damage was noted as a result of this test.

2. **Repetitive Shock Test.** Test Pallet 3 was vibrated 90 minutes at 180 RPM in the lateral orientation. The adapter pins broke causing the load to shift on the deck approximately 6". The tests were stopped with the pallet failing due to the fact the pallet could not have continued to be used in a safe manner. The probable cause of the failure was due to the banding being too loose, which allowed the load to move around on the deck breaking the adapter pins. Again, the banding was not tightened to try to lessen the "rocking" motion problem identified in Pallets 1 and 2.

3. **Conclusion.** The pallet did not meet MIL-STD-1660, "Design Criteria for Ammunition Unit Loads". The failure was believed to be caused by the loose bands, which was done intentionally to try to eliminate the "rocking" motion of the pallet. The final conclusion is that the reason for the failures for Pallets 1 and 2 was believed to be due to undue stress from excessive loading on the middle skid due to the bowed pallets. It is believed that Pallet 3 would have had the same type of failure as Pallets 1 and 2, if the banding had been properly tightened. It was discussed and decided that a new set of three pallets will be manufactured and tested.

E. **SET 2, PALLET 1A - TEST RESULTS:**

The second set of three pallets was received in early May 2001 along with the Quality Control data inspection sheets. The data inspection sheets showed that

the pallets met the design criteria. The pallets were flat and did not appear to have the "rocking" problems that were constant in the first set of pallets.

1. **Compression Test.** Test Pallet 1A was compressed with a load force of 9,200 pounds for 60 minutes on 14 May 2001. No damage was noted as a result of this test.

2. **Repetitive Shock Test.** Test Pallet 1A was vibrated 90 minutes at 157 RPM in the longitudinal orientation and 90 minutes at 169 RPM in the lateral orientation. It should be noted that the RPM is lower than the RPM used for the first set of pallets. This is believed to be due to the fact that the pallet is more rigid, requiring less RPM to vibrate the load at the required amplitude. There was no damage to the pallet as a result of this test.

3. **Edgewise Rotational Drop Test.** Test Pallet 1A was edgewise rotationally dropped from a height of 15 inches on the longitudinal and 15 inches on the lateral drops. The strut skid welds broke in several places, but it should be noted that there were no strut deck welds broken. The damage was deemed to be minor with further inspection to be done during disassembly of the pallet.

4. **Incline-Impact Test.** The test pallet was incline-impacted on all four sides with the pallet impacting the stationary wall from a distance of 8 feet. Again, no additional problems were encountered.

5. **Sling Compatibility Test.** The test pallet was lifted off of the ground using the top lift adapter by four points, three points, two diagonal points, and two adjacent points. No shifting of the containers or permanent deformation of the top lift adapter was noted.

6. **Forklifting Test.** The test pallet was lifted from the end of the pallet on the forks of the forklift truck and carried over the hazard course three times

with no damage or instability noted. The pallet lifted from the side of the pallet and the above steps accomplished with no problems encountered.

7. **Disassembly Test**. During the disassembly of the pallet the only additional damage found on the pallet was the adapter pins were bent but not broken. The bent pins and cracked strut skid welds mentioned earlier are considered to be minor. The pallet could have continued to be used in a safe manner, therefore the pallet passed.

8. **Conclusion**. Test Pallet 1 met MIL-STD-1660, "Design Criteria for Ammunition Unit Loads".

F. **SET 2, PALLET 2A - TEST RESULTS:**

1. **Compression Test**. Test Pallet 2A was compressed with a load force of 9,200 pounds for 60 minutes on 16 May 2001. No damage was noted as a result of this test. See Figure 5 for test setup.

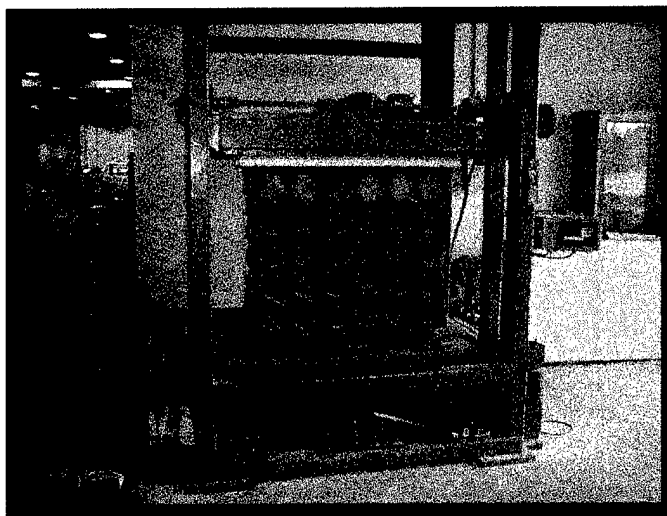


Figure 5. Test setup of Compression Test.

2. **Repetitive Shock Test.** Test Pallet 2A was vibrated 90 minutes at 171 RPM in the longitudinal orientation and 90 minutes at 180 RPM in the lateral orientation. There was no damage to the pallet as a result of this test. See figure 6 for test setup.

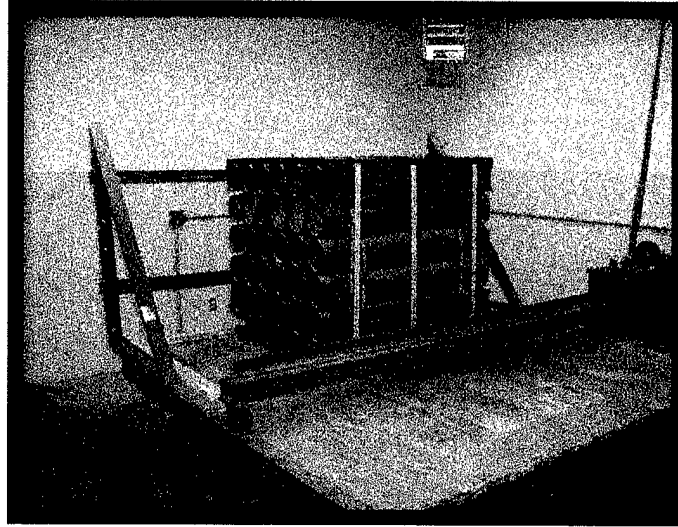


Figure 6. Test setup of Repetitive Shock Test.

3. **Edgewise Rotational Drop Test.** Test Pallet 2A was edgewise rotationally dropped from a height of 15 inches on the longitudinal and 15 inches on the lateral drops. The post skid welds broke in several places, but it should be noted that there were no post deck welds broken. The damage was deemed to be minor with further inspection to be done during disassembly of the pallet. See Figure 7 for test setup.



Figure 7. Test setup of Edgewise Rotational Drop Test.

4. **Incline-Impact Test.** Test Pallet 2A was incline-impacted on all four sides with the pallet impacting the stationary wall from a distance of 8 feet. Again, no additional problems were encountered. See figure 8 for test setup.



Figure 8. Test setup of Incline-Impact Test.

5. **Sling Compatibility Test.** Test Pallet 2A was lifted off of the ground using the top lift adapter by four points, three points, two diagonal points, and two adjacent points. No shifting of the containers or permanent deformation of the top lift adapter was noted.

6. **Forklifting Test.** Test Pallet 2A was lifted from the end of the pallet on the forks of the forklift truck and carried over the hazard course three times with no damage or instability noted. The pallet lifted from the side of the pallet and the above steps accomplished with no problems encountered.

7. **Disassembly Test.** During the disassembly of the pallet the only additional damage found on the pallet was two minor deck weld cracks. The deck weld cracks and the post skid weld breaks mentioned earlier are considered to be minor. The pallet could have continued to be used in a safe manner, therefore the pallet passed.

8. **Conclusion.** Test Pallet 2A met MIL-STD-1660, "Design Criteria for Ammunition Unit Loads". Having met MIL-STD-1660 requirements wherein only two of three pallets must pass test criteria, the third pallet was not tested.

PART 6– DRAWINGS

The following drawing represents the load configuration that was subjected to the test criteria. The final load drawing is AMC Drawing # 19-48-4231/45-20PM1006. This drawing may be located at:

<http://www.dac.army.mil/DET/dapam/toc.html>

APPENDIX 45

UNITIZATION PROCEDURES FOR AMMUNITION AND COMPONENTS PACKED IN CYLINDRICAL METAL OR PLASTIC CONTAINERS ON 4-WAY ENTRY METAL PALLET

CARTRIDGE, 105MM. PACKED 1 PER PA117
CYLINDRICAL METAL CONTAINER, UNITIZED 30
PER 44" X 40" PALLET; APPROX CONTAINER
SIZE 44-1/2" L X 6-7/8" W X 6-7/8" H

NOTICE: THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH
THE BASIC UNITIZATION PROCEDURES DRAWING 19-48-4231-20PM1006.

DISTRIBUTION STATEMENT A.
APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION IS UNLIMITED.

U.S. ARMY MATERIEL COMMAND DRAWING									
APPROVED, U.S. ARMY INDUSTRIAL OPERATIONS COMMAND <div style="display: flex; justify-content: space-between;"> AMSTA-AR-ESK AMSIO-THJ </div>				DRAFTSMAN		S. VON THUN			
				ENGINEER		L. FIEFFER			
APPROVED BY ORDER OF COMMANDING GENERAL, U.S. ARMY MATERIEL COMMAND U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL REVISION NO. 1 JUNE 1998 SEE THE REVISION LISTING ON PAGE 2				SUPPLY ENGINEERING DIVISION		TRANSPORTATION ENGINEERING DIVISION		VALIDATION ENGINEERING DIVISION	
				LOGISTICS ENGINEERING OFFICE					
				DECEMBER 1990					
				CLASS	DIVISION	DRAWING	FILE		
				19	48	4231/ 45	20PM 1006		

DO NOT SCALE

PROJECT CA 243/45-87

PALLET UNIT DATA				
ITEMS INCLUDED		HAZARD CLASS AND DIVISION *		APPROX WEIGHT LBS
NSN	DDIC	DD CLASS	COMP GROUP	
1315-UNASSIGNED	C445	TO BE DETERMINED		1,998
01-371-2990	C449	(12)1.2 I G		2,258
UNASSIGNED	C473	TO BE DETERMINED		1,998
UNASSIGNED	C479	TO BE DETERMINED		2,078
UNASSIGNED	C540	TO BE DETERMINED		2,198
UNASSIGNED	C542	TO BE DETERMINED		2,198
01-324-8633	C543	(04)1.2 C		1,998
01-320-4190	C544	(10)1.2 E		2,258
01-250-2857	C546	(10)1.2 E		2,258
01-398-8836	CA01	(10)1.2 E		2,258

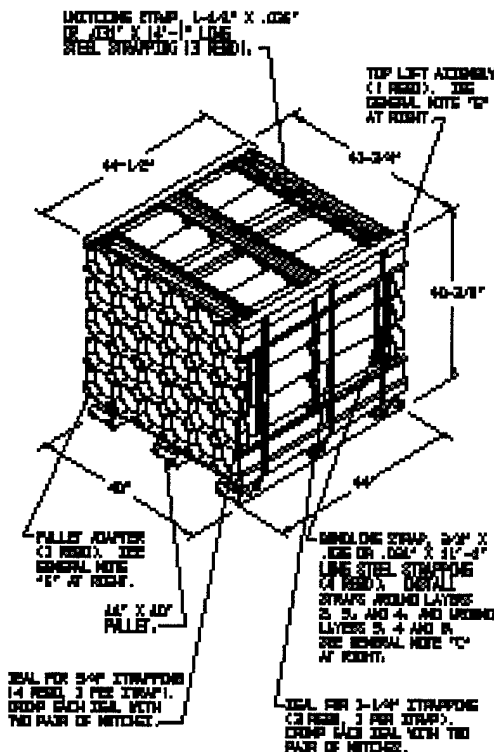
* HAZARD CLASSIFICATION DATA CONTAINED IN THE ABOVE CHART IS FOR GUIDANCE AND INFORMATIONAL PURPOSES ONLY. VERIFICATION OF THE SPECIFIED DATA SHOULD BE MADE BY CONSULTING THE MOST RECENT JOINT HAZARD CLASSIFICATION SYSTEM LISTING OR OTHER APPROVED LISTINGS.

REVISION

REVISION NO. 1, DATED JUNE 1986, CONSISTS OF CHANGES PER GCP M673001 INCLUDING:

1. ADDING ITEM BY NATIONAL STOCK NUMBER TO "PALLET UNIT DATA" CHART.
2. DELETING ITEM BY NATIONAL STOCK NUMBER FROM "PALLET UNIT DATA" CHART.
3. CHANGING HAZARD CLASS FOR ITEMS ON "PALLET UNIT DATA" CHART.
4. DELETING GENERAL NOTE RELATING TO STRAP CUTTER AND RE-LETTERING OTHER GENERAL NOTES ACCORDINGLY.
5. CHANGED SPECIFICATIONS IN THE GENERAL NOTE RELATING TO PALLET ADAPTER AND TOP LIFT ASSEMBLY.

RECEIVED 11/2



BULLET UNIT

SEE REMARKS PAGE TWO AT RIGHT.

20 COMPLAINTS OF WORK CIRCUMSTANCES

```

1L PER CONTAINER) = 50 LBS - - - - - 5,000 LBS (MAXIMUM)
EQUIPAGE - - - - - 112 LBS
PAVLT - - - - - 106 LBS

```

TOTAL WEIGHT - - - - - 5.289 LBS (LIFTING)
CUBE - - - - - 26.46 CUBIC FEET (CARRY)

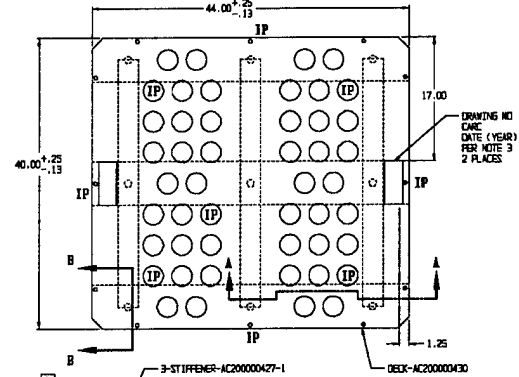
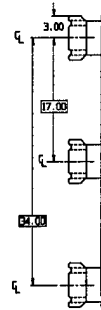
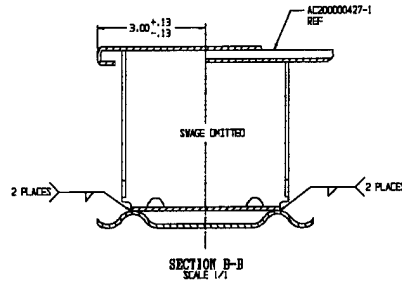
CELL OF MATERIAL

META PALLET, 44" X 47"	---	3	REQD	---	-100	LBS
PALLET WADDER	---	3	REQD	---	-40	LBS
TOP LIFT ASSEMBLY	---	3	REQD	---	-84	LBS
STEEL STRAPPING, 3/4"	---	46.33	REQD	---	3.08	LBS
STEEL STRAPPING, 1-1/4"	---	42.29	REQD	---	8.40	LBS
SEAL FOR 3/4" STRAPPING	---	4	REQD	---	---	NOL
SEAL FOR 1-1/4" STRAPPING	---	3	REQD	---	---	NOL

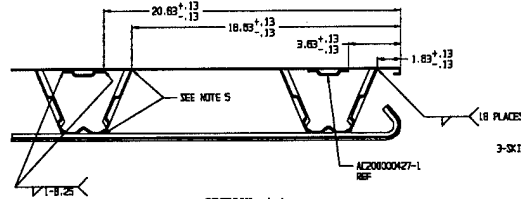
- A. THIS APPENDIX CANNOT STAND ALONE BUT MUST BE USED IN CONJUNCTION WITH THE BASIC UNIFICATION PROCEDURES. DRAWING NO. 48-0223-3090000 IS REQUIRED FOR APPROVED UNIT LOAD, ALL PORTANT PROCEDURES, SPECIFICATIONS AND CRITERIA SET FORTH WITHIN THE BASIC DRAWING WILL APPLY TO THE PROCEDURES DELINEATED IN THIS APPENDIX. ANY EXCEPTIONS TO THE BASIC PROCEDURES ARE SPECIFIED IN THIS APPENDIX.
- B. DIMENSIONS, CURVE AND HEIGHT OF A PALLET UNIT WILL VARY SLIGHTLY DEPENDANT UPON THE ACTUAL DIMENSIONS OF THE RAILS AND THE HEIGHT OF THE SPACED LIFT BELLS UNITS/BOX.
- C. SHOULDER STRAPS MUST BE TIGHTENED AND SEALS PRIOR TO THE APPLICATION OF THE UNIFICATION STRAPS. 30%TALL SHOULDER STRAPS AS CLOSE TO THE OUTER CONTAINER BELL AS POSSIBLE, TO AVOID DAMAGE TO THE CONTAINER.
- D. ALTHOUGH THE CONTAINERS DEPICTED IN THE UNIT LOAD AT LEFT ARE CONSTRUCTED WITH INTERLOCKING JOINTS, THE INTERLOCKING WILL NOT FUNCTION PROPERLY UNLESS THE CONTAINERS ARE POSITIONED SO THAT THE "POKE" OF THE INTERLOCKING IS FACING THE SAME DIRECTION WILL ADD TO THE PREVENTION OF CONTAINER WRECKAGE, BOTH LATERALLY AND LONGITUDINALLY, DURING SHORTEN OF THE BOX LOAD.
- E. THE FOLLOWING LMC DIMENSIONS ARE APPLICABLE FOR AUTOMOBILES AND STORAGE OF THE ITEMS COVERED IN THIS APPENDIX.
- | | | |
|------------------|------|---------------------------------|
| CARLOADING | ---- | 48-02-0240/44-1940000 |
| TRUCKLOADING | ---- | 48-02-0240/44-1940000 |
| STORAGE | ---- | 48-02-0250/44-1-C-24-14-2500000 |
| END OF BOXES COO | | |
| CONTAINER | ---- | 48-02-0240/44-1940000 |
| WELSHAW | ---- | 48-02-0240/44-1940000 |
| CODE DRAWING COO | | |
| CONTAINER | ---- | 48-02-0270/44-1940000 |
- F. IF ITEMS COVERED HEREIN ARE UNLOADED PRIOR TO UNLOADING OF THIS APPENDIX, THE CONTAINERS NEED NOT BE RELOADED SIMPLY TO CONFORM TO THIS APPENDIX.
- G. THE DETAILS OF THE PALLET ADAPTER AND TOP LIFT ASSEMBLY, ARE RELAYED IN SPECIFICATION NO. 4-107000, NO. 4-107000, AND AERON DRAWING AERON-300.
- H. THE UNIFICATION PROCEDURES DEPICTED HEREIN MAY ALSO BE USED FOR UNIFICATION 10000 CONTAINERS WHEN IDENTIFIED BY OFFICIAL NATIONAL CODES NUMBERED 10001 THRU 10000. IT IS NOT TO BE USED FOR UNIFICATION 10000 CONTAINERS UNLESS NOT VARY FROM WHAT IS DELINEATED HEREIN. THE COMPLETE CLASSIFICATION OF OTHER CTRIC MAY BE DIFFERENT THAN WHAT IS SHOWN.
- J. SIXTY OR MORE SIXTY FOLLER CONTAINERS WILL BE USED AS FOLLER CONTAINERS AS NECESSARY. FOLLER CONTAINERS MUST BE IDENTIFIED IN THE TOWELS OF THE TOP LAYERS OF CONTAINERS. CONTAINERS MUST BE IDENTIFIED AS FOLLER CONTAINERS IN THE TOWELS OF THE TOP LAYERS OF CONTAINERS. CONTAINERS MUST BE IDENTIFIED AS FOLLER CONTAINERS TO COMPLETE A LAYER OF A PALLET. THEY WILL BE MARKED AS SPECIFIED WITHIN MIL-STD-129-1.

- NOTES:
1. MIL-A-2550, AMS/ANS A2 4-BB, ASME Y14.5M-1994 AND MIL-P-70706 APPLY.
 2. PROTECTIVE FINISH SHALL BE IN ACCORDANCE WITH DRAWING AC200000423. COLOR SHALL BE GREEN NO 363 PER MIL-C-46108 (FED STD NO 34004).
 3. MARKING PAINT SHALL BE IN ACCORDANCE WITH DRAWING AC200000423. COLOR SHALL BE WHITE NO 37875 PER FED-STD-595, .50 INCH HIGH LETTERS.
 4. WELDMENT CONSTRUCTION AC000515, CLASS 1, APPLIES.
 5. MAXIMUM GAP ALONG WELD LINE BETWEEN POST AND DECK OR POST AND SKID WILL NOT EXCEED .02 INCHES PRIOR TO WELDING. THIS MAY BE CHECKED WHEN RESTRAINED BY UP TO 1500 LBS UNIFORMLY APPLIED TO THE TOP SURFACE OF THE DECK.
 6. THIS DIMENSION IS TO BE CHECKED AT THE INSPECTION POINTS (IP) DEFINED IN THE TOP VIEW. THE MEASUREMENTS WILL ORIGINATE FROM DATUMS A AND B.

REV	DESCRIPTION	DATE	BY
1	PRODUCT BASELINE	98-04-10	TPT
2	FOR 885450	98-04-10	DRG/HR
3	FOR 885450-017	98-08-18	DRG/HR
4	FOR 885450-017	98-07-20	DRG/HR
5	FOR 885450-017	98-08-02	DRG/HR
6	FOR 885450-017	98-08-02	DRG/HR
7	FOR 885450-017	98-08-02	DRG/HR
8	FOR 885450-017	98-08-02	DRG/HR
9	FOR 885450-017	98-08-02	DRG/HR
10	FOR 885450-017	98-08-02	DRG/HR



DRAWING NO.
DATE (YEAR)
PER NOTE 3
2 PLACES



SEE NOTE 5

18 PLACES

3-SKID-AC200000428-1

3-STIFFENER-AC200000427-1

9-POST-AC200000429

18 PLACES

DECK-AC200000430

PART NO AC200000431

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

18 PLACES

DISTRIBUTION STATEMENT A:
APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION IS UNLIMITED.

DESIGN ACTIVITY	88-02-15
DESIGNER	J. J. MICHIELS
DESIGNED BY	V. F. ERNST
DESIGNED BY	JOHN L. BYRD JR.
APPLICATION	
SCALE	1/2
SHEET	1 OF 1